SPECTROPHOTOMETRIC OBSERVATIONS OF COMET P/GIACOBINI-ZINNER

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Spectroscopic observations of comet P/Giacobini-Zinner were performed on 20 March, 20 and 21 June, 11 September, and 19 October 1985. The September observations were performed at perihelion, *exactly* at the time of the International Cometary Explorer (ICE) encounter with the comet.The March and June observations were obtained with an Intensified Image Dissector Scanner (IIDS) on the 2.1-meter Kitt Peak telescope and the September and the October observations were obtained with a Charge-Coupled Device (CCD) on the 4-meter Kitt Peak telescope.

In the spectrum obtained in March, only CN(Δv=0) emission was marginally present with a strength $\sim 1\sigma$ above the noise level. Nucleus spectra obtained on June 20 and 11 September are shown in Figures 1 and 2. Neither Na nor C_2^+ was detected in the September spectrum. Therefore Na^+ and C_2^+ can be excluded from the candidates for the ions in the mass range 23 to 24 amu detected by the ICE ion composition experiment (Ogilvie et al.1986).

The brightness profile of C_2 and the lifetime of the parent of C_2, 1.1×10^5 s, indicate that C_2 molecules probably come from many different sources which may include C_2H_4, C_2H_2, and dust. From brightness profiles obtained from the September observations it was found that C_2 and NH_2 are depleted in Giacobini-Zinner by factors of ~ 10 and ~ 5 respectively compared with the normal comet (Scleicher et al. 1987). Detailed anylyses of the brightness profiles of these species made using Monte Carlo techniques have been

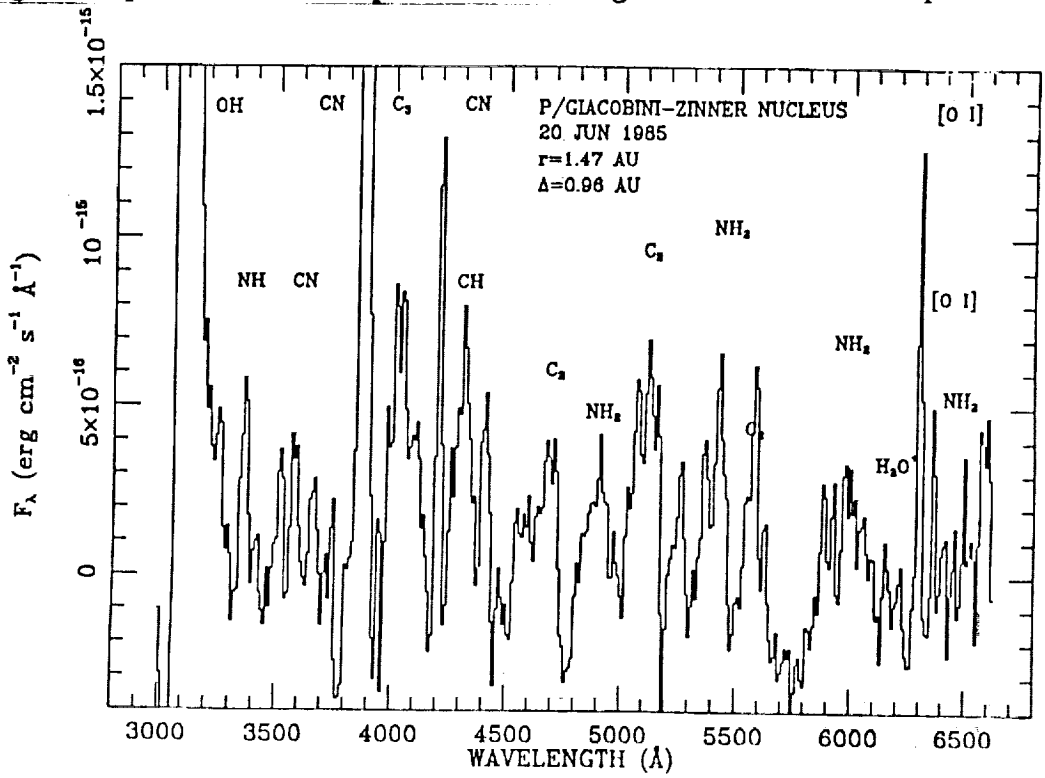

Fig. 1. Nucleus spectrum of comet Giacobini-Zinner on 20 June 1985.

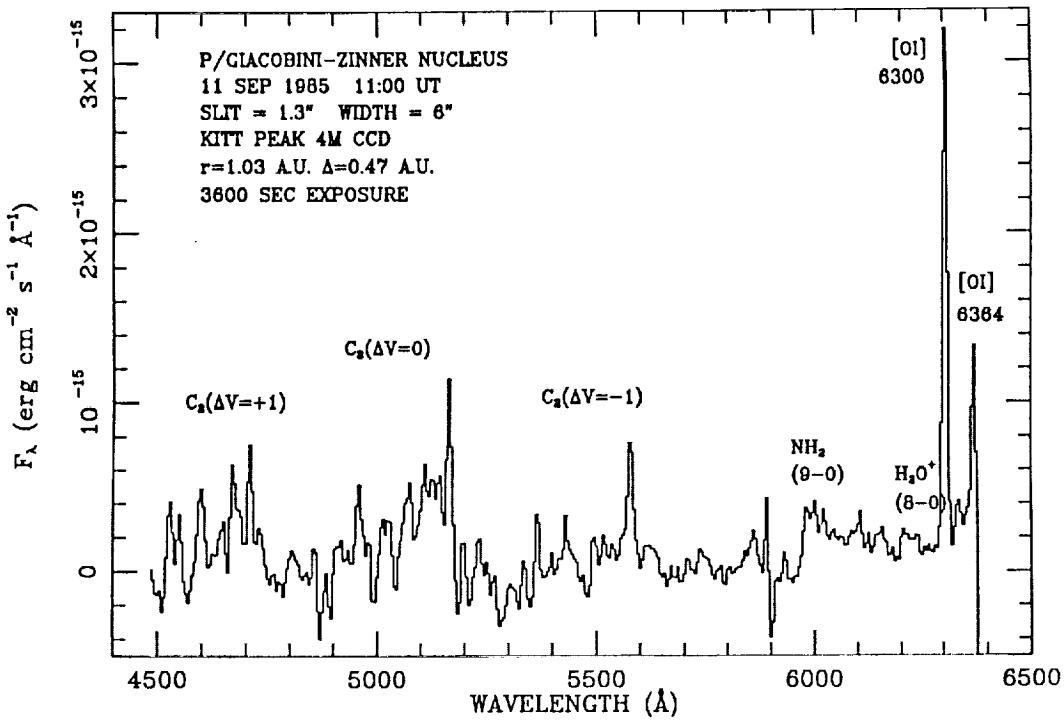

Fig. 2. Nucleus spectrum of comet Giacobini-Zinner on 11 September 1985.

discussed elsewhere (Konno 1987, Konno and Wyckoff, 1988). Observations in June indicate that C_3 and NH may also be depleted in Giacobini-Zinner by ~ 8 and ~ 5 times the normal value, respecrively. The ratio of the production rates, $Q(NH_2) = Q(H_2O) = 2 \times 10^4$ indicate a very low NH_3/H_2O abundance ratio if NH_2 comes mostly from photodissociation of NH_3.

The water production rates for the comet were found from the measurements of the [O I]6300Å line: 1.7×10^{28} at $r = 1.47$ AU on 20 June, 1.7×10^{28} at $r = 1.46$ AU on 21 June, 2.4×10^{28} at $r = 1.03$ AU on 11 September, and 2.6×10^{28} at $r = 1.20$ AU on 19 October. The value on 11 September falls in the range $2 \times 10^{28} - 5 \times 10^{28}$ molesules s^{-1} indicated by IUE and the Pioneer Venus Orbiter (Stward et al. 1985). From $r = 1.47$ AU to $r = 1.03$ AU (perihelion) the production rate changes as $\sim r^{-1}$ but it does not fall off after perihelion from September to 19 October ($r = 1.20$ AU). This behavior may be due to heating of the outer layers of the nucleus at perihelion, so that the production rate probably did not change to the distance $r = 1.20$ AU.

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